



## Major Article

# Eight years of decreased methicillin-resistant *Staphylococcus aureus* health care-associated infections associated with a Veterans Affairs prevention initiative



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## Key Words:

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**Background:** Declines in methicillin-resistant *Staphylococcus aureus* (MRSA) health care associated infections (HAIs) were previously reported in Veterans Affairs acute care (2012), spinal cord injury (SCIU) (2011), and long-term-care facilities (LTCFs) (2012). Here we report continuing declines in infection rates in these settings through September 2015.

**Methods:** Monthly data entered into a national database from 127 acute care facilities, 22 SCIUs, and 133 LTCFs were evaluated for trends using negative binomial regression.

**Results:** There were 23,153,240 intensive care unit (ICU) and non-ICU, and 1,794,234 SCIU patient-days from October 2007-September 2015, and 22,262,605 LTCF resident-days from July 2009-September 2015. Admission nasal swabbing remained >92% in all 3 venues. Admission prevalence changed from 13.2%-13.5% in acute care, from 35.1%-32.0% in SCIUs, and from 23.1%-25.0% in LTCFs during the analysis periods. Monthly HAI rates fell 87.0% in ICUs, 80.1% in non-ICUs, 80.9% in SCIUs, and 49.4% in LTCFs (all *P* values < .0001 for trend). During September 2015, there were 2 MRSA HAIs reported in ICUs, 20 (with 3 in SCIUs) in non-ICUs, and 31 in LTCFs nationwide.

**Conclusions:** MRSA HAI rates declined significantly in acute care, SCIUs, and LTCFs over 8 years of the Veterans Affairs MRSA Prevention Initiative.

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We previously reported significant decreases in methicillin-resistant *Staphylococcus aureus* (MRSA) transmissions and health care-associated infections (HAIs) in Veterans Affairs (VA) acute care medical centers nationwide from October 2007-June 2012,<sup>1</sup> in spinal cord injury units (SCIUs) from October 2007-June 2011,<sup>2</sup> and in long-term-care facilities (LTCFs) from July 2009-December 2012.<sup>3</sup> Here we update the continuing trends in MRSA transmissions and HAIs in all 3 settings through September 2015, which constitutes 8 years of the VA MRSA Prevention Initiative.

## METHODS

Details of implementation of the VA MRSA Prevention Initiative and data collection were reported previously.<sup>4</sup> Surveillance was performed at the local facility by the MRSA prevention coordinator as previously described<sup>4</sup> and facilitated with the use of nationally distributed software that extracts MRSA nares screening, clinical culture, and patient movement data within a selected facility. The software provides reports containing data required for entry by the MRSA prevention coordinator each month into the national Inpatient Evaluation Center database located in Cincinnati, OH. For this report, monthly MRSA transmission and HAI data from October 2007-September 2015 from all 127 acute care facilities (having 162-183 ICUs and 366-425 non-ICUs [wards] nationally during the analysis period), 22 facilities with SCIUs, and 133 LTCFs were pooled by

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setting for analyses. Monthly rates were expressed as the number of transmissions or HAIs per 1,000 patient-days (or resident-days), and trends were examined by means of negative binomial regression using SAS version 9.4 (SAS Institute Inc, Cary, NC). A transmission was defined as a patient found to be colonized or infected with MRSA >48 hours after admission who had been MRSA negative at admission and for the 12 months preceding admission. HAIs were defined using National Healthcare Safety Network (NHSN) criteria but required a positive culture, not just a physician's diagnosis. VA had previously defined HAIs as those occurring >48 hours after admission. During October 2013, VA adopted the NHSN rule where an HAI is defined as an infection occurring on or after day 3 of admission.<sup>5</sup> Analysis of these data was approved by the Cincinnati VA Medical Center Institutional Review Board.

## RESULTS

In VA acute care facilities nationwide from October 2007-September 2015, there were 5,530,104 admissions to or transfers or discharges from intensive care units (ICUs) and non-ICUs (ICUs, 1,009,763; non-ICUs, 4,520,341) and 23,153,240 patient-days (ICUs, 3,544,167; non-ICUs, 19,609,073). The mean monthly compliance with screening upon admission to the acute care facility and to each unit upon transfer remained  $\geq 95.1\%$  and upon discharge from each unit remained  $\geq 92.6\%$  throughout the 8-year analysis period. The prevalence of patients colonized or infected with MRSA at admission to the facility increased slightly from 13.3% in April 2008 (when the definition was changed to include patients who had been colonized or infected with MRSA within 12 months before admission) to 13.5% in September 2015. Transmission and overall HAI rates in ICUs and non-ICUs fell significantly (Fig 1 and Table 1). Device and nondevice-associated bloodstream infection (BSI), lower respiratory tract infection, and urinary tract infection rates in the ICUs and non-ICUs also fell significantly over the 8-year period ( $P < .0001$ ) (Table 1). Nondevice BSI rates fell significantly faster in the ICUs than those not associated with a central line ( $P < .0001$ ). In the final year of the analysis, there was a monthly mean  $\pm$  standard deviation of  $6.5 \pm 3.4$  MRSA HAIs in VA ICUs and  $23.0 \pm 3.4$  MRSA HAIs in non-ICUs (which includes  $5.7 \pm 2.1$  in SCIUs) reported nationwide.

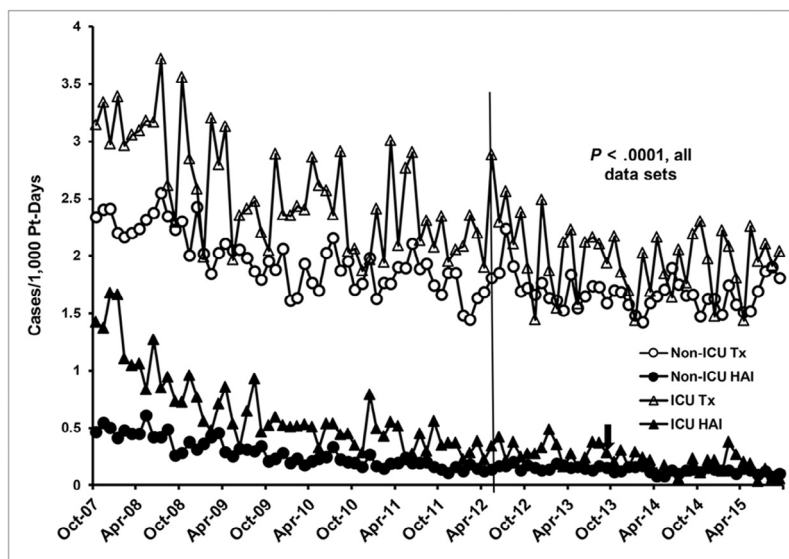
There were 71,170 admissions to or discharges from SCIUs and 1,794,234 patient-days in these units from October 2007-September 2015. The percentage of patients screened for MRSA colonization or infection at admission increased from 83.3% in April 2008-94.8% in September 2015 and discharge swabbing compliance increased from 67.0%-90.5% at the same time points. The mean monthly MRSA admission prevalence fell from 35.1% in April 2008-32.0% in September 2015. Monthly HAI rates fell significantly but transmission rates did not fall significantly over the 8-year analysis period (Table 1).

During the analysis period, there were 312,541 admissions and 22,262,605 resident-days in VA LTCFs from July 2009-September 2015. The mean monthly compliance with screening remained  $\geq 95.4\%$  upon admission to the LTCFs and  $\geq 89.5\%$  upon discharge. The mean monthly MRSA admission prevalence increased from 23.1%-25.0% over the analysis period. Monthly HAI rates fell significantly during the analysis period (data on transmissions were not reported consistently in the LTCFs) (Fig 2 and Table 1). Monthly device and nondevice urinary tract infection rates as well as device-associated BSI rates fell significantly ( $P \leq .02$ ), although the rate of nondevice BSIs did not fall significantly ( $P = .16$ ) (Table 1). During the past 12 months of the analysis, there was a mean of  $31.0 \pm 5.5$  MRSA HAIs/month reported from all LTCFs nationwide.

## DISCUSSION

We previously reported that implementation of the VA MRSA Prevention Initiative was associated with significant decreases in MRSA HAIs in acute<sup>1</sup> and LTCFs<sup>3</sup> and spinal cord injury units.<sup>2</sup> The analyses presented here show that MRSA HAI rates continued to decrease nationwide over an additional 39 months in acute care, 51 months in SCIUs, and 33 months in the LTCFs and all declines were significant over the 8-year analysis period. Few MRSA HAIs were reported nationwide during the final year of the analysis.

Of note, in the ICUs over the 8-year period, nondevice BSI rates fell significantly faster than those not associated with a central line ( $P < .0001$ ). These data support the concept that the declines observed were not due solely to implementation of a formalized



**Fig 1.** Veterans Affairs (VA) acute care intensive care unit (ICU) and non-ICU methicillin-resistant *Staphylococcus aureus* (MRSA) transmission (Tx) and health care-associated infection (HAI) rates from October 2007-September 2015. MRSA transmissions and HAIs declined 36.6% and 87.0%, respectively, in the ICUs and declined 29.6% and 80.1%, respectively, in the non-ICUs ( $P$  values for 8-year trend, negative binomial regression). The arrow indicates when VA changed from defining an HAI as an infection occurring >48 hours after admission to an infection occurring  $\geq 3$  days after admission. The vertical line marks the end of the period previously reported.<sup>1</sup>

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